BARTON™
MEDICAL CORPORATION

Model FG1235 Scale Kit

Operating Manual

Barton Medical Corporation 5725 Hwy 290 West, Austin , TX 78735

BARTON™ MEDICAL CORPORATION

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SECTION I

MODEL FG1235
SYSTEM DESCRIPTION and SPECIFICATIONS

The low power microprocessor circuitry allows the FG1235 to derive it's power from the system's DC battery supply. This eliminates the need for an external battery charger or the danger of an A.C. power supply. **SYSTEM DESCRIPTION -** The FG1235 is specifically designed as a precision scale system retrofit for the Barton Medical line bariatric beds. The FG1235 Scale System employs the latest in microprocessor and load cell technology to provide accurate and repeatable weight data. Four (4) identically matched transducers are strategically placed to ensure an accurate representation of the patient's weight regardless of weight distribution.
The Patient's weight is displayed on a 16 character dot matrix liquid crystal display with L.E.D. backlighting. Patient weight may be viewed in both POUNDS and KILOGRAMS with the push of a button with a displayed resolution of 0.1 #/Kg (100 grams). The FG1235 also features a WEIGHT CHANGE mode which makes it convenient to monitor the patient's weight relative to ZERO in order to observe variations in weight. A FREEZE feature is provided to give the added convenience of being able to adjust the patient's comfort by adding or removing a pillow, blanket, or adjusting the chair without effecting the patient's displayed weight.

1.0

The patient's weight is displayed on a 16 character dot matrix L.C.D. With the push of a button, weight data may be viewed in either POUNDS or KILOGRAMS with a displayed resolution of 0.1 Lb or .1Kg.

1.1 **INTENDED USE** The FG1235 is designed for use as a patient weighing system integrated in the Barton Medical bariatric bed model _____.

1.2 **SPECIFICATIONS**

1.2.01 **Maximum Weight Capacity -** The FG1235 has a maximum weight capacity of 1500Lbs. / 680Kgs. DON NOT exceed the rated weight capacity of the bed.

1.2.02 **Display Type -** The display is a large 16 Character Dot Matrix L.C.D. with green L.E.D. back lighting. Highly visible in all light conditions,

1.2.03 **Display Resolution** – The FG1235 will display weight data in both POUNDS and KILOGRAMS with a resolution of 0.1 Lb. or 0.1 Kg.

1.2.04 **Accuracy** - The accuracy of the displayed weight is 0.2% +/- 1 digit of the displayed resolution for calibrated range (Refer to the Calibration Certificate supplied with the scale for the calibrated range).

1.2.05 **Zero** - One button Auto-Zero

1.2.06 **Auto Power Down (APD)** – The system will automatically power down in 60 seconds to conserve battery life.

1.2.07 **Averaging** – An Automatic Digital Filter samples the weight data to filter motion.

1.2.08 **Power Supply** - 24v DC.

1.2.09 **Warranty 1 YEAR LIMITED WARRANTY** - Each **SR**Scales™ scale system is manufactured with high quality components. SR Instruments, Inc. warrants that all new equipment will be free from defects in material or workmanship, under normal use and service, for a period of one year from the date of purchase by the original purchaser. Normal wear and tear, injury by natural forces, user neglect and purposeful destruction are not covered by this warranty. Warranty service must be performed by the factory or an authorized repair station. Service provided on equipment returned to the factory or authorized repair station includes labor to replace defective parts. Goods returned must be shipped with transportation and/or broker charges prepaid. SR Instruments obligation is limited to replacement of parts which have been so returned and are disclosed to SR Instruments satisfaction to be defective. The provisions of this warranty clause are in lieu of all other warranties, expressed or implied, and of all other obligations or liabilities on SR Instruments part and it neither assumes or authorizes any other person to assume for SR Instruments any other liabilities in connection with the sale of said articles. In no event shall SR Instruments be liable for any subsequent or special damages. Any misuse, improper installation or tampering, shall void this warranty.

1.2.10 **Calibration** - Calibration is traceable to NIST Standards.

1.2.11 **Operating Conditions** – Care has been taken in the design of this product to provide accurate and reliable information under normal operating conditions. When proper care is exercised, your scale will provide many years of reliable service. Normal conditions for this product would be : **Temperature Range: 20^{o}C** to **30^{o}C (68^{o}** to **85^{o}f) Humidity Range: 0%-95% (non-condensing).** Avoid exposure to high pressure water or steam.

1.2.12 **Transport and Storage** – To maintain proper operation of this instrumentation transport and storage conditions should not vary outside the following conditions: **Humidity:** 0% to 99% **(non-condensing).**, **Ambient Temp:**-20^{0}C to +50^{0}C

1.2.13 **Patient Applied Part Classification** – TYPE B

SECTION I

FG1235 Theory of Operation

1.3 The FG1235 patient weighing system is a digital weigh scale. 4 strain-gauge force cells convert the force of a patient's weight into an analog signal. This signal is amplified by a chopper-stabilized operational amplifier and converted to a digital signal by a quad slope analog to digital converter. The digital signal is transferred to a micro-controller where it is filtered, converted to appropriate units and displayed on a dot-matrix liquid crystal display.

The transducer of the FG1235 patient weighing system contains 4 strain gauge based force cells (Analog board J1..4). Each cell contains four strain gauges mounted in a full Whetstone-bridge configuration (Figure 1.) These bridges convert the physical bending of the force cell (Figure 2.), due to the patient's mass on the system, into minute changes in electrical resistance. These changes in resistance produce a voltage difference across the Whetstone Bridge, which is amplified by the chopper-stabilized operational amplifier (Analog board U1). The amplifier is configured to current sum the output of each cell, with potentiometers serving to adjust the sensitivity (voltage out per unit of weight applied) of each bridge. The offset potentiometer (Analog board R3) produces a small current, which nulls the output of the amplifier for an unloaded system.

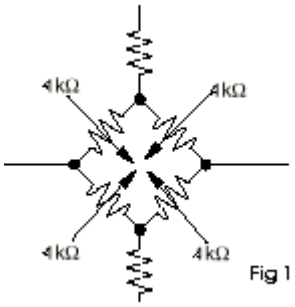


Fig 1

The output of the operational amplifier is digitized by the quad slope analog to digital converter (Analog board U5). The converter integrates the analog signal onto the integrating capacitor (Analog board C9) over a short interval. The integrating capacitor is then discharged at a rate proportional to the reference voltage applied to the converter The residual voltage on the integrating capacitor (Analog board C9) is then multiplied by a factor of eight and again discharged at a rate proportional to the reference voltage (Figure 3.). The residual voltage from this discharge is again multiplied by eight and again discharged. The time taken to discharge the capacitor is proportional to the voltage from the operational amplifier, which is proportional to the weight on the force cells. The time is stored as a binary number in the analog to digital converter and is transferred to the micro-controller when the conversion is complete.

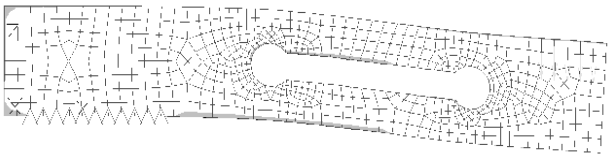
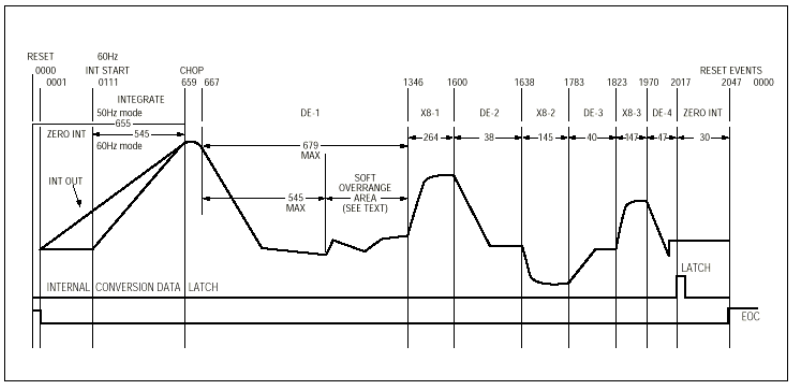


Figure 2. Force Cell bending with applied weight (displacement exaggerated for clarity)

The micro-controller averages and filters the digital output of the analog to digital converter, subtracts the value saved during the system tare operation and scales the filtered output to the appropriate units (Kg or Lb.) then displays the result on the dot-matrix liquid crystal display. The micro-controller performs a rolling average of two seconds of data for continuous weigh and, for AutoHold, the micro-controller averages two seconds of data, minimum, before locking in on the reading. If the data variance is greater than 0.1% in the AutoHold mode, the micro-controller will reset the filter and start a new averaging period.

Figure 3. Analog to digital converter timing diagram (from Maxim MAX132 data sheet).



The micro-controller can be placed in a calibration mode where the system can be re-calibrated. In the calibration mode, the result of the weigh operation is scaled to match the value entered by the decimal keypad. This new calibration factor is then stored in the non-volatile memory.

SECTION II

2.0 BUTTON FUNCTIONS and BASIC OPERATION

Procedure for Weighing

2.0.2

ZERO –
With all linens in place, press the **"ZERO"** button. The displayed message will read **" PLEASE WAIT - HANDS OFF ".** Be sure nothing comes in contact with the of the weight sensitive portion of the integrated scale system while zeroing. In a few seconds the display will indicate **"WEIGHT = 0.0 LB "**.

2.0.3

WEIGH - If the display shuts off before you are able to view the weight data, simply press the **"WEIGH"** button to wake the display and view the patient's weight. The display will **indicate "WEIGHT = XXX.X LB"** (or KG).

2.0.4

DELTA - The WEIGHT CHANGE mode is used to monitor the patient's weight relative to ZERO.

1. Press the **" WT CHG "** button. The display will read**" WT CHG=(patient weight)"**.

Any variation in weight will now be viewed as a "+" or "-" figure relative to ZERO. Pressing the **"WEIGHT"** button will switch back to the WEIGHT MODE allowing you to view the patient's total weight again.

NOTE: When you reset the **SYSTEM ZERO** in the **WEIGH** mode, **DELTA ZERO** will also be reset.

2.0.5

FREEZE / RESUME - This feature will allow you to make adjustments to the bed without effecting the displayed patient weight.

1. Press the **"FREEZE"** button. The display will read **" FREEZE = (patient weight) "**.
2. Make all necessary adjustments to bed or patient.
3. When done, press the **"RESUME"** button to resume normal weighing.

While in the FREEZE mode, the **"WEIGHT"** and **"WT/CHG"** keys will allow you to manually adjust the displayed weight reading in the event of a known error. Simply press the **"WEIGHT"** and **"WT/CHG"** keys to make the proper corrections.
NOTE: If FREEZE Mode is left unattended for more than 3 minutes, display will read **" LEFT IN FREEZE - REFER TO MANUAL"**. You must press the **"RESUME"** button to exit this mode.

2.0.6

MODE -Weight data may be viewed in either POUNDS or KILOGRAMS. Pressing the button allows you to switch between display modes quickly and easily.
Both modes will display patient weight with 0.1 units of resolution. (0.1 Lb. or 0.1 Kg.)

2.0.7 **IMPORTANT –** Be sure not to touch the patient or the chair during the zeroing and weighing process. By design, these components are weight sensitive and any interference will effect the accuracy of the weight data.

SECTION III

3.0 CALIBRATION

3.1 **Periodic Calibration Check - IMPORTANT :** The following calibration procedure should only be performed by qualified service personnel. The FG1235 load cell, itself, has no user serviceable components and should not be tampered with for any reason. Re-calibration is generally not required, but should be verified periodically to ensure accuracy. Our recommendation for calibration check is at least once every 12 months or as your maintenance policy requires.

3.2 **ESD –** The integrated circuits and semiconductors on the printed circuit boards may be damaged by electrostatic discharge (ESD). Be sure to use proper handling precautions at all times.

3.3 **CALIBRATION PROCEDURE** - NOTE: Make sure that nothing is in contact with the scale system during this procedure. Be sure to remove your hands from the system when noting the displayed calibration results.

1. **Press** and the **"FREEZE"** button.
2. When the display indicates **"FREEZE = (weight)"**, press and hold the **"LB/KG"** button. The display will read **"CAL"** as the right hand digit counts down to enter the **CAL MODE.**
3. When in the **CAL MODE**, press the **"ZERO"** button to zero the display.
4. Place a known calibrated weight on to the weighing surface and compare it to the displayed reading.
5. Use the **"WEIGHT"** button to make **"+"** corrections and the **"DELTA WEIGHT"** button to make **"-"** corrections to the displayed weight. The displayed value should be within 0.2% of the calibrated weight plus or minus 1 digit of reading.
6. Remove weight and re-zero. Repeat steps 5 and 6 until results are satisfactory.
7. When adjustments are completed:

a). Press the **"ON"** button to **ABORT** your changes and exit the CAL mode **(or)**
b). Press the **"FREEZE"** button to **SAVE** all changes and exit the CAL mode.

3.4 **CALIBRATION TOLERANCE TABLE**

LOW LIMIT	APPLIED LOAD	HIGH LIMIT
99.9	100.0	100.1
199.8	200.0	200.2
299.7	300.0	300.3
399.6	400.0	400.4
499.5	500.0	500.5
599.4	600.0	600.6
699.3	700.0	700.7
799.2	800.0	800.8
899.1	900.0	900.9
999.0	1000.0	1001.0

3.5 **MAINTENANCE, CARE and CLEANING** - The transducer housing for the FG1235 Scale System is made of powder-coated steel tube. You need only exercise caution when cleaning the display window of the electronics as this is made of clear polyester . We recommend mild soap and water for general cleaning and disinfecting.

3.5.01 **WARNING: DO NOT** use pressurized water or steam. The scale system contains microprocessor circuitry and strain gage sensors that may be adversely affected by exposure to such an environment.

3.5.02 **STORAGE –** If storing this equipment for periods longer than 3 months remove the batteries. Observe storage conditions in section 1.2.12

3.5.03 **BATTERY REPLACEMENT –** When battery replacement is needed the display will indicate “CHANGE BATTERIES”. Remove ALL SIX BATTERIES and replace with new.

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